An Energy Efficiency Workshop and Exposition

Labs21
Improving the Performance of Laboratories

A Case Study of the
Lawrence Berkeley National Laboratory

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Case Study:

The Lawrence Berkeley National Laboratory

The LBNL In-House Energy Management Program

Retrofit Projects

New Construction

Program Cost and Impact

Utility Cost Management

Lessons Learned

Strategies

Organizational structure

IHEM studies and retrofits

Life-cycle cost effective designs

Maintenance

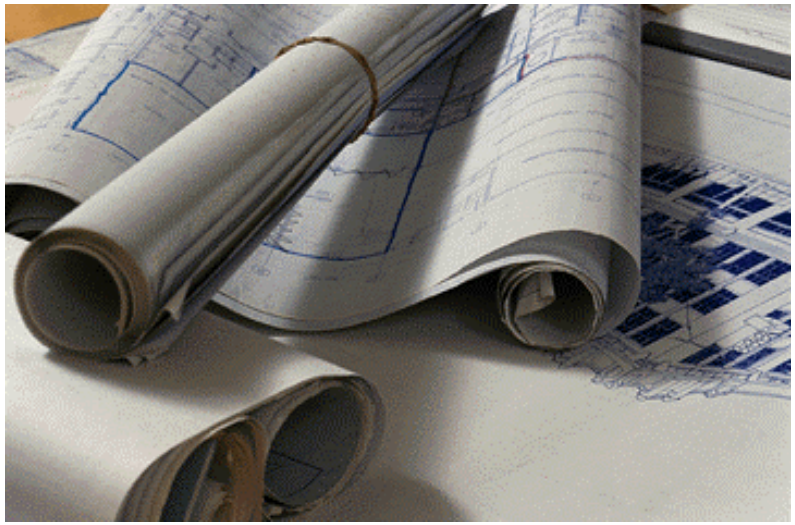
Lowest utility cost

Recharge users

Employee awareness

Track performance

R & D



Key Barrier and Success Factor

Institutional Challenge:

Success = Change

Key to Success:

Upper Management Support

Staff:

Dedicated in-house engineers, and project managers

Scientists borrowed from research division

Consultants

Retrofit Projects

Energy Efficiency Studies (40+ since 1985)

Energy Efficiency Retrofits (30+)

- Direct funded
- Utility surcharge funded
- Energy Savings Performance Contract

Typical Retrofit Projects

Constant Velocity VAV Fume Hood control

VFD control for fans and pumps

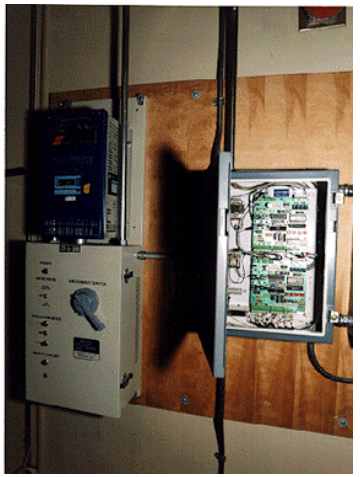
DDC/EMCS (over 8,000 points in place)

T-8/Electronic Ballast lighting

Occupancy sensor controlled lighting

LED exit signs

CFLs



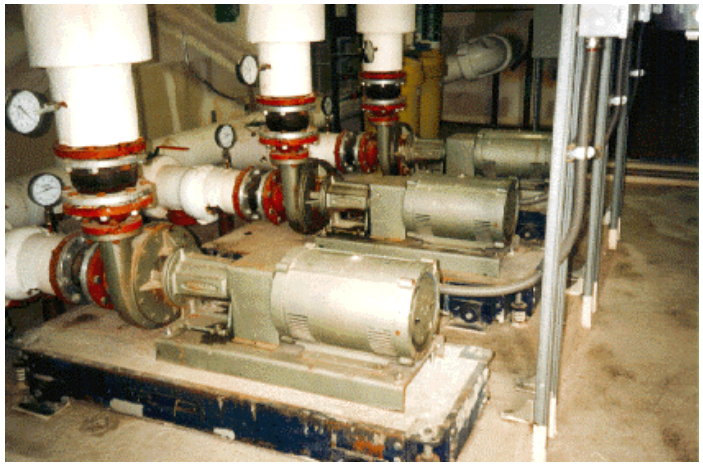
Typical Retrofit Projects - cont.

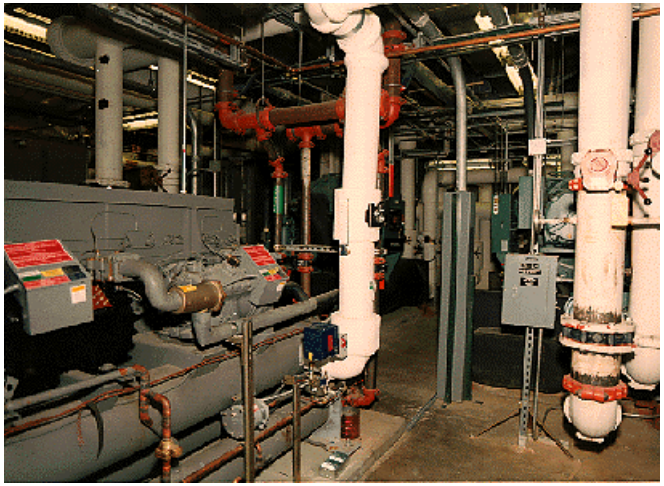
Premium Efficiency Motors

Consolidation of Boiler and Chiller plants

Modular boilers

Small base loaded chillers





Typical Retrofit Projects - cont.

Mechanical equipment replacements

Waterside economizers

Metering

Process

Instrumented Surveys

Uncovers “hidden” opportunities

Improves quantification of savings

Aids in commissioning and persistence

Can save purchase of new unneeded capacity

New Construction

New Construction

- Conceptual Design Report
- Energy Efficiency Report
- Project team participation
- Good retrofit projects

New Construction

Late design review doesn’t work!

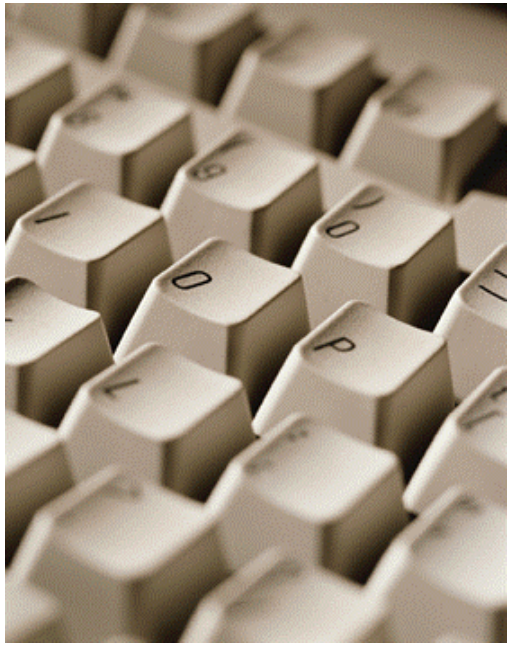
- Design decisions are made
- Appliqué - not a systems approach
- Options easy to analyze
- No big hits
- No budget

Input at Conceptual Design Phase is Critical

Identify key opportunities

Provide direction (priority) to A/E team

Establish budget line-item(s)



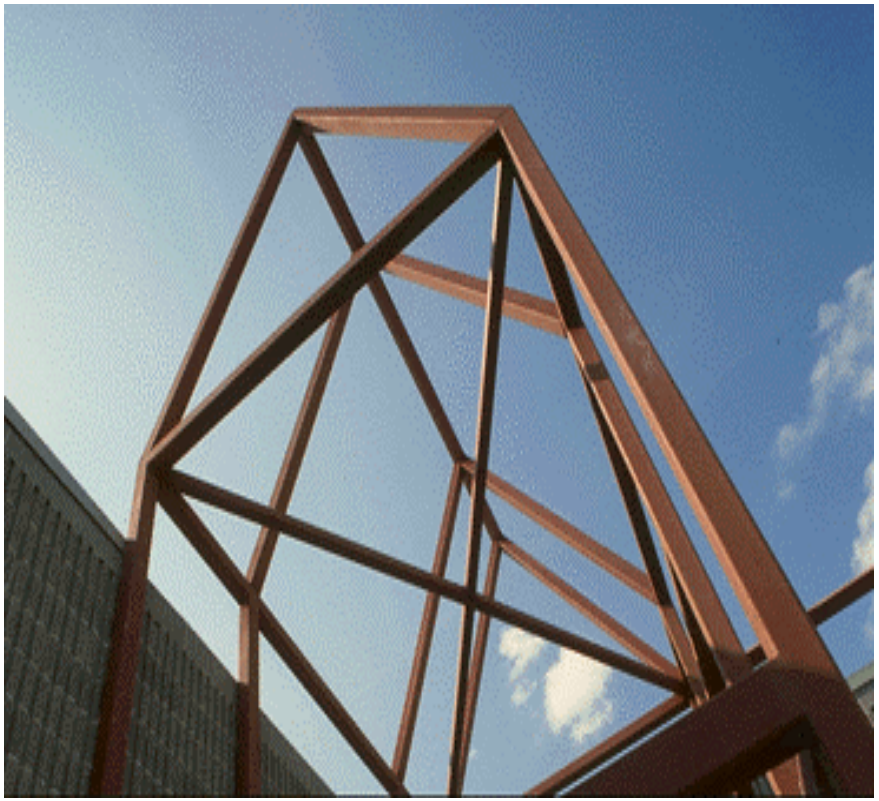
Reduce Load

Focus on the **big** hits

Energy Efficient Design Process - A Systems Approach

What does it mean

Potential to reduce first cost



Encourage Inter-disciplinary Communication

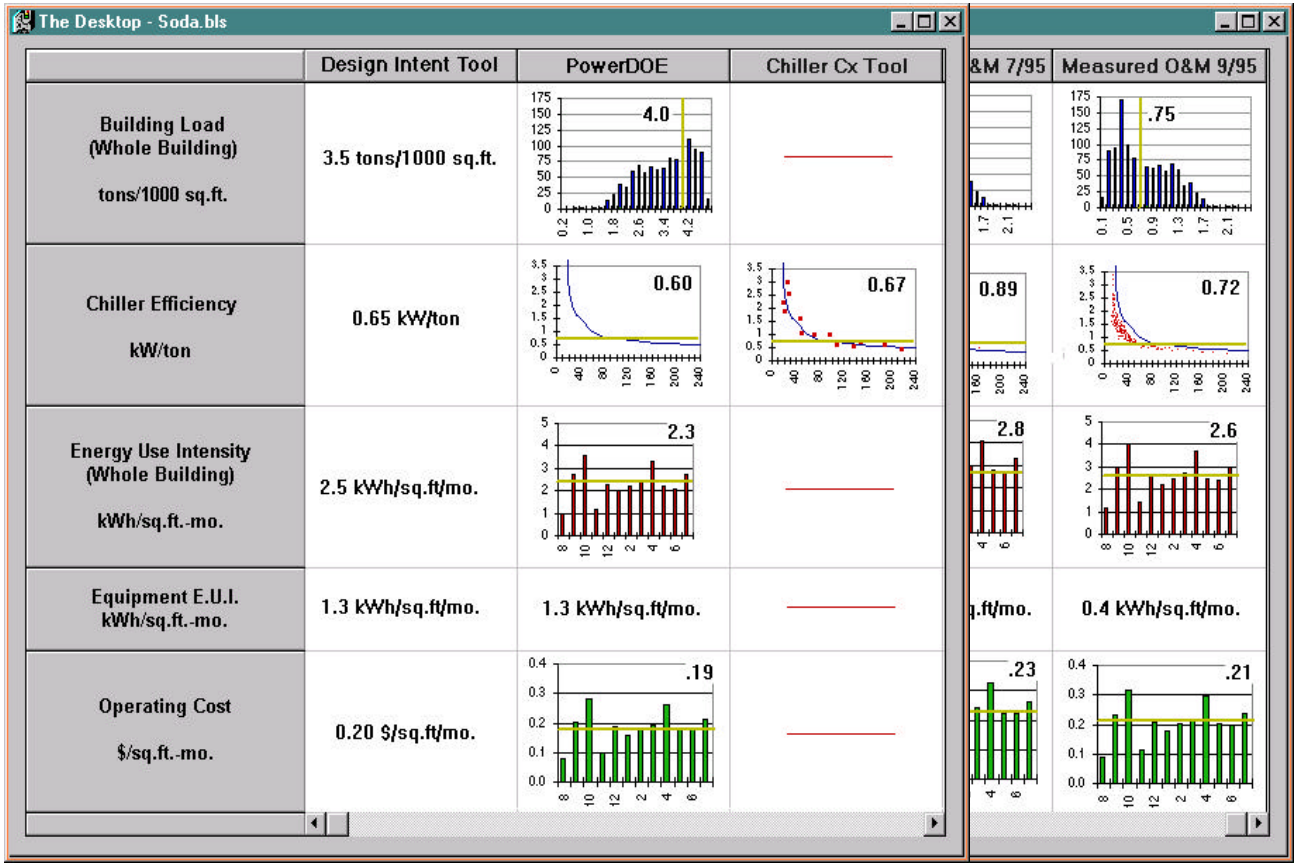
Design Charrette

Regular meetings
(not another one!)

Your ideas

Life Cycle Communications

Building Life Cycle Information Systems



Mitigate Risk

Internal: CHANGE = RISK

External: A/E

- “New” technology risk
- Load assumptions

Goal:

Energy Efficiency is the Base Case!

Opportunities are Real

41% reduction in energy use per square foot from 1985 baseline

$4.4 million/year more research based on 1985 energy prices

Pollution reduction:

- 14,174 tons CO2
- 12,885 tons SO2
- 9,449 tons Nox

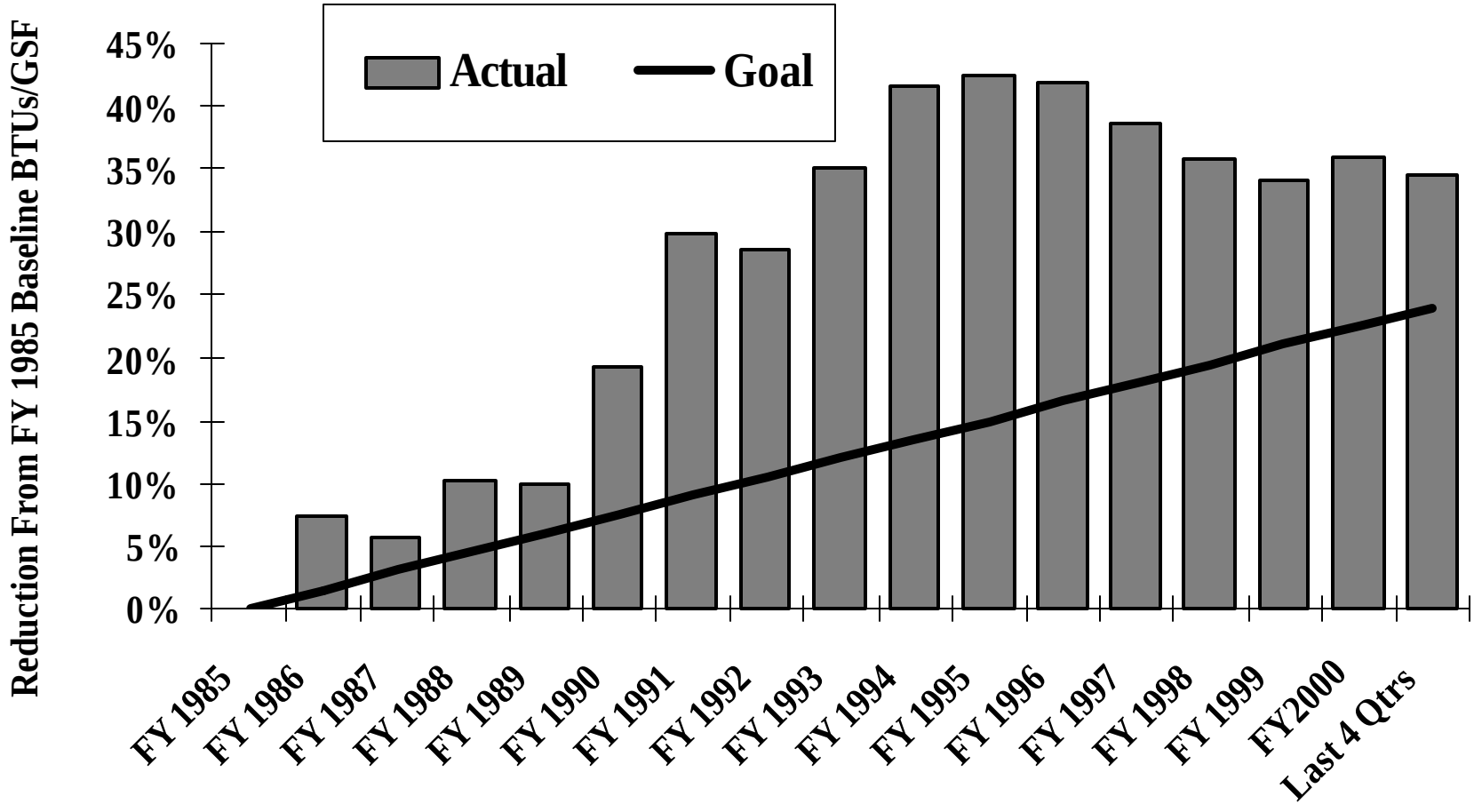
Improved worker productivity

Safer environment

Improved reliability

Opportunities are Real

Reduction in Buildings BTUs/GSF



Potential Savings

New construction

Retrofit

Investment Required

Studies: $2.6 million

Retrofit: $20 million

Utility Cost Management

Billing errors (Typically $75-100K/year)

Electricity: WAPA @ $.035/KWh (-)

Natural Gas: Defense Fuel Supply Center
Saving $.10/Therm

Overall 40% savings due to rate reduction

Integrated Supply and Demand Side Energy Management

Potential Savings Over 60%

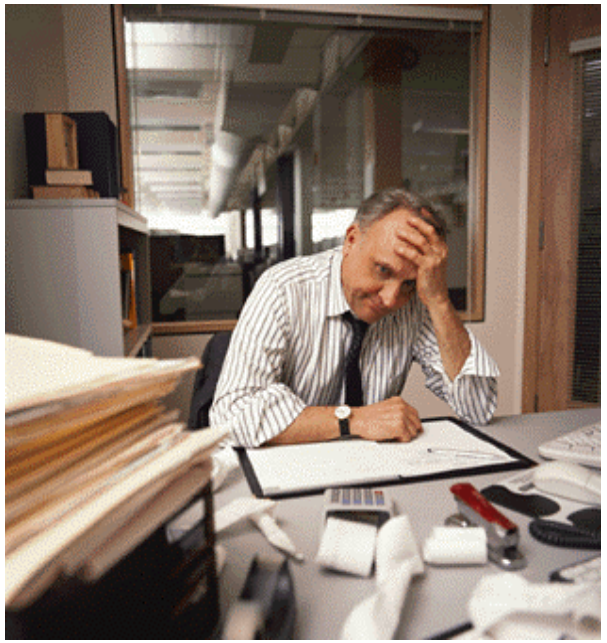
baseline:	$11.0 million
actual:	$ 3.8 million
overall savings	$7.2 million (or 65%)

New Energy Market

Seek utility supply "partners" providing an integrated approach

Beware of one sided proposals

Beware of take-or-pay utility outsourcing



Drivers

Save money

Free up capacity

Improve safety

Improve maintenance/reliability

Improve comfort and environmental quality

Improve process

Eliminate CFC’s

Lessons Learned:

Outside air dominant load - focus on HVAC

Fume hood VAV (constant velocity) safe and efficient

DDC/EMCS to zone

Commissioning and ongoing O&M important

Don’t oversize boilers and chillers - use modular units

Avoid reheat

Technology is improving

Success Factors

Champion

Identify hot buttons

Upper management support

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